

### Appendix C - Emissions Reductions/Cost Effectiveness

Annual Estimates of Housing Units for Counties in California: 2000 to 2006								
	Housing unit estimates							
	Year 2000	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	AVG/Cty/YR
LA	17,071	18,253	19,364	21,313	26,935	25,647	26,375	22,137
OC	12,367	8,646	12,020	9,311	9,322	7,206	8,342	9,602
RC	15,410	19,014	22,664	30,361	34,226	34,134	25,284	25,870
SB	6,580	8,527	10,616	12,640	18,470	16,684	13,872	12,484
Citation: Construction Industry Research Bureau, 2007								

	Annual Avg. Housing by County	Percent of County W/District	Total Housing Constructed W/District	Percent Households W/Fireplaces <sup>1</sup>	Total Fireplaces W/District	Percent Dedicated Natural Gas <sup>2</sup>	Total Traditional Fireplaces
LA	22,137	0.9697	21,466	0.4	8,586	0.25	2,147
OC	9,602	1	9,602	0.4	3,841	0.25	960
RC	25,870	0.9741	25,200	0.4	10,080	0.25	2,520
SB	12,484	0.7607	9,497	0.4	3,799	0.25	950

6,577

**Notes:**

- 1 - 40% of new housing units have active fireplaces (ARB, Section 7.1 - Emissions Estimation Methodology, July 1997)
- 2 - 75% of new housing units with fireplaces are dedicated natural gas units (estimate). 25% factor used to represent traditional, uncontrolled fireplaces

## Emission Reductions

### Paragraph (d)(1)

6,577 HHs constructed w/traditional fireplaces (from page 1)  
0.28 avg cords per HH (ARB, 1997)  
1,400 avg kgs per cord (Houck, 2006)  
392 avg kgs of wood burned per HH

658 10% of HHs installing EPA Phase II-certified (estimate)  
5,590 85% of HHs installing dedicated NG unit (estimate)  
329 5% of HHs installing electric unit (estimate)

6.29 reductions (grams/kg) from installing EPA Phase II-certified  
12.9 reductions (grams/kg) from installing natural gas appliance  
13 reductions (grams/kg) from installing electric unit

1,622 kgs reduced from HHs with EPA Phase II-certified  
28,270 kgs reduced from HHs with NG unit  
1,676 kgs reduced from HHs with electric unit

31,567 Annual kgs of PM reduction

34.72 Annual tons PM reduced from standards for new construction

0.73 Discount factor for wood burning fireplaces not used

25.3 Adjusted annual tons PM reduced from new construction

25.3 Total tons PM reduction per year

## Cost-Effectiveness

### Paragraph (d)(1)

6,577 HHs constructed w/traditional fireplaces  
2,500 incremental cost to install EPA Phase II-certified unit (SMAQMD, 2006)  
500 incremental cost to install dedicated NG unit (SMAQMD, 2006)  
400 incremental cost to install electric unit (SMAQMD, 2006)

1,644,250 capital costs for US EPA Phase II-certified wood burning device  
2,795,225 capital costs for natural gas  
131,540 capital cost for electric unit

4,571,015 Total capital costs

0 O&M costs presumed to be equivalent to existing non-compliant technology

12.50 present value factor (5% interest rate)

25.3 annual emission reductions

Cost effectiveness of paragraph (d)(1) and subdivision (e) provisions

$$\begin{array}{rcl} \frac{K + (O\&M \times [PVF])}{\text{Emission Reductions} \times 20 \text{ years}} & = & \frac{4,571,015 + 0}{507} \\ & & \\ & = & \frac{4,571,015 \text{ \$ annual costs}}{507 \text{ 20 years of ER}} \\ & & \\ & = & 9,016 \text{ \$ per ton PM}_{2.5} \text{ reduced} \end{array}$$